SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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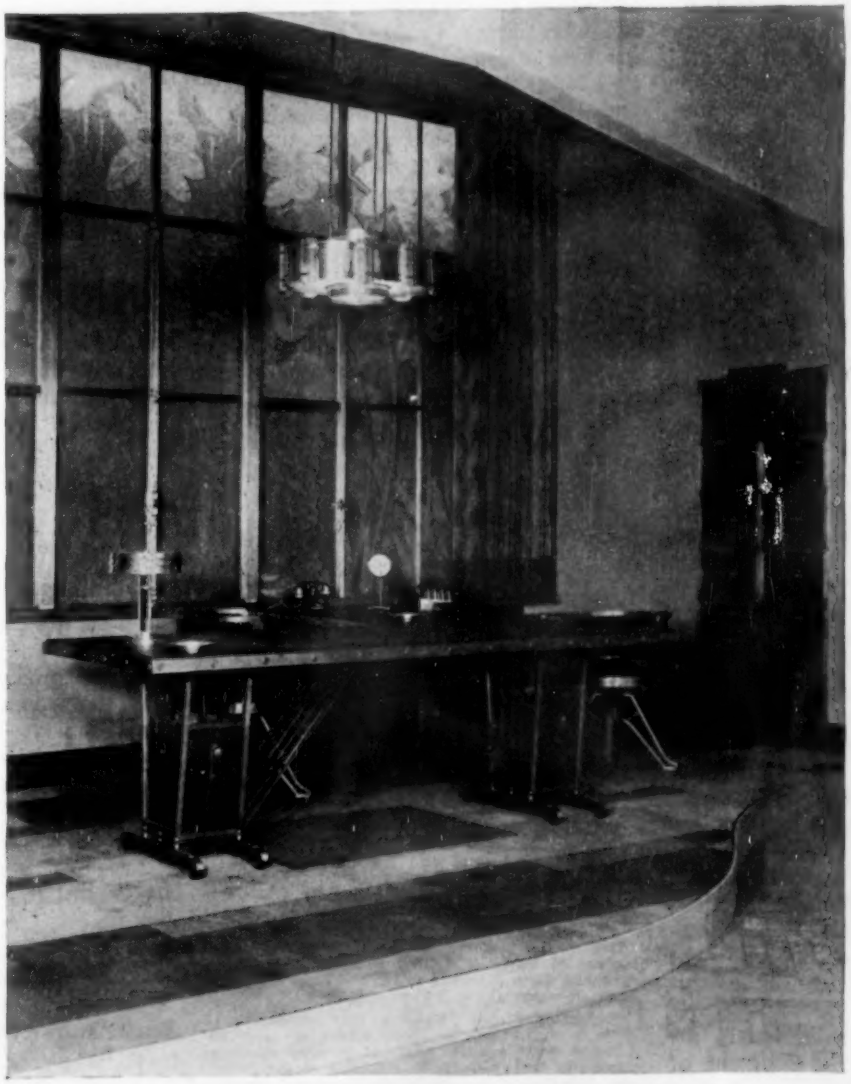

NOT MICHELANGELO'S OFFICE

Science Builds Better Workrooms for Brains

(*See Page* 158)

Vol. XV No 414

The Contemporary Office

Design

Contemporary art seems to be here to stay. On the cover of the SCIENCE NEWS-LETTER this week is shown a business executive's office in the contemporary manner—part of an exhibit of contemporary design held at the Metropolitan Museum of Art in New York City. How scientific developments have made this new design possible in this particular instance is best explained in the words of Raymond M. Hood, the architect, in a catalogue which will soon be issued.

"The task of the contemporary designer," he says, "is first to search for the practical solution of his problem, and then to avail himself of every material, every invention, every method that will aid him in its development. He does not forget that it is his business to fashion the materials that he uses into a beautiful form, but he realizes that only by this road can he hope to find the real beauty which will be the harmonious expression of modern life. Especially must there be acknowledgment of the fact that the machine, as a tool of the designer, has replaced the craftsman in contemporary production, and has, therefore, tremendously influenced modern design.

"Perhaps I can best express my conception of the new movement by an illustration. If I were asked if I could build a more beautiful business office than Michelangelo, I should say, 'No, but I can build a better business office.' My office would be better lighted, better heated, have furniture better suited to its needs, and so on, all for the simple reason that I have new materials, new processes, and new inventions at my command, of which Michelangelo did not dream. The office might not be so beautiful, but it would certainly be more convenient, more comfortable, and better suited to its purpose. But it would not be as good, and would undoubtedly be less beautiful than Michelangelo's, were I to limit myself to the materials, the craftsmanship and the relatively simple contrivances of his period.

"This introduction will explain my point of view in the development of the business office. . . . The layout and design of the different elements were controlled by present-day requirements. In general, each material has been chosen because of its fitness for the work it is to do, and with regard to economical upkeep and sanitary qualities. Its decorative treatment, then, has been dictated by the capabilities of the machine or process by which it is made.

"The executive sits with his back to the light as people enter. His desk is arranged to receive the proper working light, and at the same time to give him the restful distraction of an outdoor view. Facing him is his secretary's chair, while his visitors may group themselves about the conference table contiguous to his desk at right angles without disturbing his work. The walls and ceilings are covered with fabrikoid, a machine product which far excels in durability, cheapness, quality of surface, sureness of effect, and variety of expression the old methods of plaster and paint and wood paneling. The furniture is made of aluminum, a material as strong, light and adaptable for the purpose as wood, but one that is not subject to shrinking, swelling, warping, and the necessity of repeated refinishing. The large window, made possible by modern heating, lights the room with a great area of subdued light, rather than by a small area of intense light. The curtain permits a complete regulation of light and air."

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Government tests show that boxes made of green lumber and allowed to dry have only about one-quarter to one-half the resistance to rough handling compared with boxes made of dry lumber and stored in a reasonably dry place.

A wild flower garden, with more than a million plants representing 1,000 species, will be a new feature of a hotel in the Yosemite National Park.

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Carbon Monoxide Threatens in Homes

Physiology—Chemistry

By Jane Stafford

Every second millions of cubic feet of poison gas are poured into the air of America. Every one of the 28,000,000 automobiles of the world at every turn of the crank shaft contributes to the deadly fumes, at the rate of one cubic foot per minute. Every chimney belches forth the death gas. Every gas stove and every gas heater in a home is a potential source of this peace-time killer. It has no odor, no taste, no color by which its victims might be warned of its presence. It strikes secretly, stealing into the blood stream and throwing out the precious oxygen without which our bodies cannot go on living. It is carbon monoxide.

Realizing that the gas is death dealing in quantity, and everpresent in small amounts in city air, experts engaged in the protection of the health of the public have wrinkled their brows over the possibility that this poison, like lead, is insidious in minute amounts if the victim is exposed long enough.

Would the machine-age poison undermine the mind of a progressing race? Would the insidious silent poison accumulate in the blood, change the brain tissues? These are questions of vast importance to the crossing policemen, the garage worker, the housewife who works over a gas cook stove. Fortunately the answer seems to be "No" so far as mental dangers from the gas are concerned. But the poison remains in our air and must be reckoned with. This deadly gas is composed of one part of carbon, a substance which is found in such friendly and harmless things as charcoal, coal, diamonds and many foods, and is an essential constituent of sugars and starches. The other part of the gas is oxygen, which by itself is an important part of the air we breathe and the water we drink. The chemical combination of these substances forms the death gas, carbon monoxide. Yet the addition of one more invisible atom of oxygen changes the death gas to the inert and harmless gas called carbon dioxide.

Every time carbon-containing fuels such as coal, wood, gasoline and natural and manufactured gas are burned without enough oxygen or air for complete combustion, carbon monoxide is formed. Plenty of oxygen must be present, either as oxygen gas or in the air, so that the carbon can pick up the atoms of oxygen and so form the harmless carbon dioxide. Manufactured gas may contain anywhere from 10 to 30 per cent. of carbon monoxide gas. Automobile exhaust gas contains an average of 7 per cent.

WARMING UP THE ENGINE in a closed garage gave carbon monoxide a chance to do its deadly work. The son sent his mother for a doctor while he dragged his father outside and started artificial respiration

Large amounts of carbon monoxide are fatal to those who breathe it, but in small amounts it has no lasting effect on the health or mind of persons exposed to it, the U. S. Bureau of Mines and the U. S. Public Health Service have found by recent studies. From two to four parts of carbon monoxide in 10,000 parts of air is considered a safe amount for an hour's exposure. The average amount found in city streets is much less than this. Engineers recently examined the air in the streets of Chicago. They found that in resident and industrial streets the air contained an average of 0.125 parts carbon monoxide per 10,000. In traffic streets the proportion rose to 0.25 parts per 10,000, while in boulevard streets the highest concentration, 0.476 per 10,000, was found. Studies made in 14 cities by the Bureau of Mines and the U. S. Public Health Service showed an average of 0.8 parts per 10,000.

Carbon monoxide poisons its unlucky victims by suffocation due to lack of oxygen. Hemoglobin, the red coloring matter of the blood, has a strong affinity for the deadly gas. When carbon monoxide gets into the blood stream, the hemoglobin throws out its precious oxygen in order to unite with the death gas. Then the tissues of the body get a smaller and smaller supply of oxygen from the blood and after a time they have not enough oxygen to live.

Exercise or any physical exertion increases the need for oxygen. That is why death from carbon monoxide poisoning comes more quickly when the victim exerts himself in his struggle to escape. In rescuing a person who has been exposed to a large amount of the fatal gas, carry him to safety and keep him from exerting himself as much as possible. Oxygen or fresh air if oxygen is not available should be given him to breathe, so that the impoverished tissues can replenish their supply of oxygen as the carbon monoxide is gradually driven from the blood. If the patient is found unconscious he should be given artificial respiration. This and the oxygen should be continued for at least one-half hour and as long as three hours after he has recovered.

A very few minutes' exposure to large amounts of (*Turn to next page*)

Deadly Gas Threatens in Homes—*Continued*

carbon monoxide gas will kill a man unless he is discovered and given proper treatment at once. The amount of the blood's hemoglobin that is combined with carbon monoxide determines when death will occur. This varies somewhat with the individual, but in general a man will have a headache when 20 per cent., or one-fifth, of the hemoglobin is combined with the deadly gas. When 35 per cent. or more hemoglobin is combined with carbon monoxide he will become unconscious. Death occurs when 70 to 80 per cent. of the hemoglobin is combined. Dr. R. R. Sayers and W. P. Yant of the Bureau of Mines devised a test for determining easily and quickly the carbon monoxide saturation of the blood. This furnishes a helpful guide as to how long treatment should be continued. A drop or two of blood diluted with water and mixed with tannic and pyrogallic acids is matched against a series of colors representing known amounts of carbon monoxide saturation. If the sample of blood so treated matches the tube marked 20 per cent., that blood has 20 per cent. of its hemoglobin still combined with the gas.

Small amounts of carbon monoxide may not prove fatal, but they may cause definite symptoms and not a little distress and even disability to work. Headache across the forehead, nausea and dizziness are among the chief symptoms of carbon monoxide poisoning. Prolonged exposure or slightly higher concentrations may result in loss of consciousness. In acute cases that may result in death, loss of consciousness occurs quickly, sometimes before the victim realizes his danger.

The greatest number of carbon monoxide deaths in one series reported were due to gas from gasoline engines running in enclosed places, the running automobile in the closed garage. Imperfect connections and poor construction or adjustment of gas stoves, light burners and heaters in homes cause many deaths every year. The gas heater in a small room is a big menace because in small rooms where windows and doors are tightly closed and several people are breathing the supply of oxygen quickly becomes dangerously low. Then even a small amount of carbon monoxide is fatal, as it is lack of oxygen that really causes death, and not excess of carbon monoxide. Winter months always see a big increase in deaths from this cause. People keep their windows and doors shut tight and use gas for additional heat in their homes. They heat their automobiles from the motor exhaust. They run the engine hard, often while the car is still in the garage, to warm it up on frosty mornings. All of these are dangerous practices, particularly the last.

The latest study of the Public Health Service and the Bureau of Mines was made in an effort to determine whether long exposures to small amounts of the gas would have any ill effects on the average person or cause permanent damage to the body tissues. Traffic policemen, especially those on duty in the new Holland vehicular tunnels connecting New York City and New Jersey, would be in grave danger if small amounts of the gas for long periods of time had the same effect as large amounts of the gas in a short time. As a matter-of-fact, the officers on duty in the tunnel complain of headache after only a few hours and at present are not able to serve longer than two hours at a time. The ventilation of the tunnel keeps the concentration of the carbon monoxide gas far below the amount considered safe. Samples of the air at frequent intervals in the tunnel are taken continuously and examined for carbon monoxide. When the concentration gets above the safe limit more oxygen is pumped into the tunnel. So the traffic officers' headaches are not due to carbon monoxide poisoning, but probably to eye strain attendant on watching closely the thousands of cars flashing by every hour.

For the study just completed six men were examined carefully by a competent physician and by two psychologists and pronounced in good physical and mental health. They were then exposed to low concentrations of carbon monoxide from a gasoline engine for from four to seven hours every day for 68 days. During the study and at its close the same physician and psychologists examined the subjects. They could not find any harmful effects, either physical or mental, due to the exposure to these low concentrations of carbon monoxide. The subjects did not lose weight nor did their appetites flag. There was no muscular weakness. The number of red cells and amount of hemoglobin of the blood actually increased during the test. The men slept well throughout the test and afterwards.

When the concentration of carbon monoxide was two parts per 10,000 half the subjects had no symptoms, such as headache or dizziness, no matter how long they were exposed. A few complained of slight discomfort and others had headache after from three and one-half to four hours' exposure at this concentration. With the concentration increased to 3 parts per 10,000 no symptoms were noted in two hours, but after three and one-half hours some complained of headache and after five hours over half (65 per cent.) had distinct symptoms. With a concentration of 4 parts per 10,000 frontal headache was had by some in from one and one-half to two hours. After from three and one-half to four hours' exposure more than 90 per cent., that is, nearly all, had distinct symptoms.

Exercise, even of a mild sort, such as walking about the room, brought on the symptoms sooner. No signs of harmful effects (*Turn to page* 165)

THE DOCTOR sent for the local fire department to bring their oxygen inhalator

New Rubber Plant From Madagascar

Botany

A new species of rubber tree, hitherto unknown in this country and almost exterminated in its native land, has been brought back to Washington by Dr. Charles F. Swingle of the U. S. Department of Agriculture from Madagascar. The plant is one of the most remarkable rubber producers that has ever lived, in the ease with which the gum can be harvested. The rubber separates itself out from the latex on exposure to the air, according to Dr. Swingle, and no elaborate coagulation or smoking process is necessary. Years ago, when the natives of Madagascar were collecting rubber for the French, they would simply cut long gashes in the bark of the tree, and then go round next morning and peel out strips of rubber.

The difficulty about this primitive collecting was that it came during a time of high rubber prices, and the natives were encouraged into excessive and wholly unregulated exploitation. The result was that they killed the goose that laid the golden eggs, and in a few years there were no more of these rubber trees.

The fact that any of them survived at all is due, Dr. Swingle says, to the unique root system of the tree, which is unlike that of any other known plant. It consists of chains of tuberous thickenings like sweet potatoes, strung together after the fashion of sausages. The tubers are storage organs for water, enabling the plant to survive in the desert, through a drought as long as six rainless years. With this system of underground life-insurance, the remnants of the rubber forest were able to survive the massacre, and to begin life over again for the species after the rubber hunters had gone away.

But so nearly completely had the species been wiped out that aside from the specimens now growing in a locked greenhouse in Washington there is not another living plant outside of Madagascar, and even dried herbarium specimens are rare. The U. S. National Herbarium does not have one.

With the assistance of Prof. Henri Humbert of the University of Algiers, a noted French botanist who is an expert on the plants of Madagascar, Dr. Swingle brought out his stock of living specimens of the plant. The species can be propagated from stem cuttings, but it is of slow growth, and it will require years before the stock can be increased to a point where commercial experiments can be undertaken.

Dr. Swingle states that the new plant is probably best adapted for cultivation in the Southwest. It can certainly survive the drought of that country; the question that needs to be determined now is its ability to withstand light frosts. If it is too tender for even such cold weather as comes to Southern Arizona, it can certainly be grown in Mexico, and may be destined for a share in the economic rehabilitation of that country. Its slow growth may make ordinary plantation methods unprofitable, but experiment may possibly demonstrate that it can grow faster under irrigation.

It is a member of the Euphorbia family, and is therefore related to the Para rubber tree, but more closely to the poinsettia, the Christmas thorn and a number of other milky-juiced ornamentals. It grows to be a small tree, though, like many other Euphorbias, it has almost no leaves. Dr. Swingle states that the largest specimens he saw were about twelve feet high and about five inches in trunk diameter, though trees a foot through and twenty feet high are reported. Its technical name is *Euphorbia Intisy*.

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Radio Fading Forecasts Weather

Physics—Meteorology

When the intensity of radio signals from station KDKA, as received at Morgantown, W. Va., falls after sunset, the next day brings clearing weather. Rising intensity of the signals in the evening means the coming of cloudiness or rain.

This has been determined by Dr. R. C. Colwell, of West Virginia University. With a recorder he made a series of curves showing how the intensity of the signals from KDKA, located in Pittsburgh, varied as sunset came on and darkness followed.

Forty curves made last autumn were used to make weather predictions. "Thirty-eight of these were correct," he said, "and the other two were nearly correct; the percentage of correctness being ninety-five. The weather forecast as published in the evening paper was correct for twenty-eight days, or seventy per cent. It should be noticed, however, that the radio forecast is for Morgantown only, while the other covers the whole state.

"The forty curves comprise three in September, twenty-five in October, and twelve in November, so that the radio intensity method of weather forecasting seems to be valid over a wide range of weather conditions and temperature changes. So far, however, it has only been applied to the one station and the one locality.

"As the high and low pressure areas of the weather cyclones sweep across the continent from west to east, they seem to be accompanied by some electric condition which affects radio reception. In all probability the low pressure areas reach Pittsburgh and Morgantown at the same time since these two cities are on the same meridian; similarly for the high-pressure areas. The inference may be drawn that high-pressure areas between two places on the same meridian will weaken the radio signals that night while low pressure areas have the opposite effect."

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Weather Service for Airmen

Meteorology

Further extension of Weather Bureau service to aviators is authorized in an item of $350,000 in the Second Deficiency bill passed by the last Congress.

Eight new central Weather Bureau stations to receive reports from 37 Weather Bureau stations and 41 substations, are contemplated, according to the U. S. Weather Bureau in Washington.

It is planned to give a 24-hour weather report service to air ports from points all along the air routes, and to include news of storms and winds which may have occurred to one side of the flying route. These, it is explained, may not have influenced the flying route up to the time of the report, but might influence it later.

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For the first time in almost 2,000 years, Hebrew characters now appear on coins of Palestine.

A Child of the Plateau

Palæontology

HENRY FAIRFIELD OSBORN, in *Human Biology*:

In this somewhat divided state of mind, strongly inclining toward the ape-man hypothesis but with some misgivings on the score of limb proportions, of structure of the hand, of the tool-making capacity of the brain, I accompanied Roy Chapman Andrews on a rapid reconnaissance journey into the very heart of the Desert of Gobi. Carefully trained to observe and to reconstruct past conditions from geological and palæontological data rapidly traversing in the course of ten days five or six hundred miles of the now bare and desert but formerly hospitable country, I suddenly found myself forming an entirely new concept of human origin, namely, that the actual as well as the ideal environment of the ancestors of man was not in the warm forested lowlands of Asia or of any other continent, but in the relatively high, invigorating uplands of a country such as Central Asia was in Miocene and Oligocene time—a country totally unfitted to any form of anthropoid ape, a country with meandering streams, sparse forests, intervening plains and meadow lands. Here alone are rapidly moving quadrupedal and bipedal types evolved; here alone is there a premium on rapid observation, on alert and skillful avoidance of enemies; here alone could the ancestors of man find the materials and early acquire the art of fashioning flint and other tools.

These conclusions and others too numerous to mention in detail sent me back to Peking a complete convert to an entirely new concept of the ecology or environmental conditions of primitive man; he coul dnot have been a forest-liver; he could not have inhabited a warm tropical country; he could not have learned to fashion tools where no flints or rocks capable of being shaped into tools were to be found; he could not have preserved and improved by intelligently directed use the marvelous powers of the human thumb unless opposed to the flexible fingers. Immediately I announced my conversion before the assembled scientists and naturalists in Peking from all lands, but not until three years later, on April 29, 1927, on the occasion of the two hundredth anniversary of the foundation of the American Philosophical Society, was I able seriously to formulate a new theory of the plateau origin of man and to challenge the Darwinian hypothesis not only in its original form but in its highly developed modification refined by the wealth of recent discovery in which it has been expressed by such great anatomists and anthropologists as Sir Arthur Keith and my own colleague, William King Gregory. In the few lucid intervals which I have been able to devote to this anthropological avocation in the midst of an extremely busy life, I have taken up one aspect of this subject after another; I have held a running debate with all my colleagues, none of whom, with the single exception of Tilney, is inclined to agree with me; I have sought the aid of Dubois, Tilney and McGregor in the remeasurement of the Trinil brain; I have learned from Dietrich of Berlin that the Trinil ape-man is not an ancestral link, as all of us have supposed, but a surviving, non-progressive, forest-living offshoot of some very ancient early human stock shut off from competition in the southernmost forests of Asia where food was plentiful, and that it thus affords convincing illustration that ancient and conservative types can survive only when they are shut off from competition with progressive and more adaptive stocks and when they are sheltered in warm, tropical, forest-clad regions.

The Trinil ape-man is thus dethroned from its once proud position as a Pliocene prototype and takes its place beside a few remnants of the more ancient palæontological world which were harbored in forests.

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The Motion of Venus

Astronomy

On page 135 of the SCIENCE NEWS-LETTER for March 2, in the article on Venus, it was stated, correctly, that Venus makes a complete circuit of its orbit in 225 days. As the earth itself moves in this period, however, it takes nearly a year more for Venus to catch up. Twice in this "synodic period" of 584 days the planet appears to earth-dwellers, once in the morning sky before sunrise and once in the evening sky after sunset.

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Government experiments at Sitka show that Alaska can grow commercially hardy flowering bulbs, including narcissus, tulips, English iris, gladiolus, and hyacinths.

Maya Life Still Colorful in Yucatan

Anthropology

By Emma Reh Stevenson

Life still has charm and romance in the land of the Mayas. There is much that has not changed since the days when Bishop Landa tried his hand at converting the Indians four centuries ago and complained that the Indians instead had converted Geronimo Aguilar, the first white man who lived among them. Geronimo, the bishop suspected, had become "as idolatrous as they".

Picturesqueness in the modern Maya village is not destroyed as it so often is in the Mexican villages on the mainland by dirt and misery, for the Yucatecan Indian is a luckier creature. He is cleaner, healthier and richer.

The town of Ticul, a dozen miles or so from the famous ruined city of Uxmal, is an interesting example of what has grown out of four centuries of European civilization implanted in the heart of the greatest prehistoric American civilization.

Ticul was a growing town when the white man came, as the native will tell the visitor. Today nearly every one who speaks Spanish speaks Maya too, while a large proportion of the people speak the Indian language only. There is no pure white blood left, and native blood far predominates.

In the native sections of the town the Indians still live in their huts of sticks, adobe roofed with fan-palm, much as they did before the Conquest. The most notable change is that they use the hammock, introduced from Santo Domingo, instead of the straw rug or "petate" which they used as a bed before, and hammock-making has become a Yucatecan art.

Their huts are in gardens fenced with limestone walls, rich with orange, banana, palm, papaya and sapote trees. Magenta colored bougainvilleas and fire-red "flamboyans" add startling color to the picture. The handsome Indian or mestiza women with spotless white cotton gowns brilliantly embroidered at neck and hem, walk like barefoot queens through the stony streets swinging jugs of water or naked babies on their hips. Statuesque women, with white enameled wash-basins full of beans or ground corn dough on their heads stalk out of the spotless market with its crisp green piles of herbs and heaps of seeds and washed vegetables.

Maya potters still ply their ancient trade in Ticul, and the town supplies the surrounding region with earthenware dishes, pitchers and pots. The prehistoric disk or "kabal", which was on the verge of becoming a true potter's wheel, is still used. The potter sits on the dirt floor of his hut turning the "kabal" with his toe and instep while he gouges out the wet mass of clay as it slowly turns and changes into graceful shapes under his strong fingers. Ticul yards are full of pleasant round shapes drying in the sun waiting for baking day, when they are burned in primitive ovens such as were used before America was discovered.

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Stone Age History Being Completed

Archæology

Stone-age men whose tools resemble those of the famous Cro-Magnon race of Europe, but whose skulls are like those of an early Mediterranean or "modern" race once lived in the caves of Palestine. The first knowledge of these people has been gained during recent months through the work of Miss Dorothy Garrod, a pupil of the famous Abbé Breuil. Miss Garrod's explorations have had the backing of the British School of Archaeology.

The new discoveries fill in a wide gap that hitherto existed between the story of Abraham, who came into the country from the east about 2000 B. C., and the Galilee Skull, which was found in a cave overlooking Lake Genesareth during the 1925-26 season by F. Turville-Petre. This ancient skull, belonging to the well-known primitive Neanderthal race, dates back to at least 20,000 B. C., according to Sir Arthur.

The new finds, which bridge part of this wide gap, all belong to the Old Stone Age. Miss Garrod's first explorations were in a cave on the western slopes of Mt. Ephraim, between Joppa and Jerusalem. In the lowest strata she found bones and implements of the same race as that represented by the Galilee Skull. In layers of more recent date were the remains of about twenty men, women and children, skeletally "modern", but accompanied by Old Stone Age tools.

Another preliminary exploration was made in a cave on the seaward slopes of Mt. Carmel. This region is riddled with limestone caverns, in one of which the prophet Elijah lived and which have been the abode of religious hermits for many centuries. In one of these abandoned caves Miss Garrod again found tools of Old Stone Age date, though of a more recent culture within that period than that represented by the Mount Ephraim finds.

There still remain to be found relics that will give a view of the New Stone Age, which intervened between the close of the Old Stone Age and the beginning of the Age of Bronze, to which the patriarch Abraham belonged. The Age of Iron in Palestine came in at about the time of Saul, 1200 B. C.

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One reason why the European corn borer is so difficult to exterminate is that it can live on more than 200 different kinds of plants.

Tobacco Ills Discussed

Phytopathology

The ills that tobacco is heir to, taxing growers, manufacturers and smokers alike, occupied a considerable portion of time of the American Phytopathological Society, which at the recent New York meetings celebrated the twentieth anniversary of its foundation.

Dr. W. S. Tisdale of the Florida Agricultural Experiment Station at Quincy, Fla., told of a troublesome disease that has broken out in the tobacco fields of his state, and is thought to occur also in Connecticut, Kentucky and Ohio. It is due to a microorganism known as *Septomyxa affinis*. This germ apparently likes the shaded portions of seeds beds and cool, damp weather, for it is under such circumstances that it does most harm.

Two destructive scourges of Kentucky tobacco fields, angular leafspot and blackfire, have hitherto been thought to be two manifestations of the same disease, but Dr. W. D. Valleau of the Kentucky Agricultural Experiment Station threw doubt on this assumption. Blackfire now seems to be due to insufficient nitrogen in the soil, and heavy applications of stable manure have been effective in controlling it. Angular leafspot does not respond to this treatment; it apparently traces back to a bacterial cause.

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The Outline of Wave Mechanics

Physics

A. S. EDDINGTON, in *The Nature of the Physical World* (Macmillan):

Imagine a sub-aether whose surface is covered with ripples. The oscillations of the ripples are a million times faster than those of visible light—too fast to come within the scope of our gross experience. Individual ripples are beyond our ken; what we can appreciate is a combined effect—when by convergence and coalescence the waves conspire to create a disturbed area of extent large compared with individual ripples but small from our own Brobdingnagian point of view. Such a disturbed area is recognized as a material particle; in particular it can be an electron.

The sub-aether is a dispersive medium, that is to say the ripples do not all travel with the same velocity; like water-ripples their speed depends on their wave-length or period. Those of shorter period travel faster. Moreover, the speed may be modified by local conditions. This modification is the counterpart in Schrödinger's theory of a field of force in classifical physics. It will readily be understood that if we are to reduce all phenomena to a propagation of waves, then the influence of a body on phenomena in its neighborhood (commonly described as the field of force caused by its presence) must consist in a modification of the propagation of waves in the region surrounding it.

We have to connect these phenomena in the sub-aether with phenomena in the plane of our gross experience. As already stated, a local stormy region is detected by us as a particle; to this we now add that the frequency (number of oscillations per second) of the waves constituting the disturbance is recognized by us as the energy of the particle. We shall presently try to explain how the period manages to manifest itself to us in this curiously camouflaged way; but however it comes about, the recognition of a frequency in the sub-aether as an energy in gross experience gives at once the constant relation period and energy which we have called the h rule.

Generally the oscillations in the sub-aether are too rapid for us to detect directly; their frequency reaches the plane of ordinary experience by affecting the speed of propagation, because the speed depends (as already stated) on the wave-length or frequency. Calling the frequency ν, the equation expressing the law of propagation of the ripples will contain a term in ν. There will be another term expressing the modification caused by the "field of force" emanating from the bodies present in the neighbourhood. This can be treated as a kind of spurious ν, since it emerges into our gross experience by the same method that ν does. If ν produces those prenomena which make us recognize it as energy, the spurious ν will produce similar phenomena corresponding to a spurious kind of energy. Clearly the latter will be what we call potential energy, since it originates from influences attributable to the presence of surrounding objects.

Assuming that we know both the real ν and the spurious or potential ν for our ripples, the equation of wave-propagation is settled, and we can proceed to solve any problem concerning wave-propagation. In particular we can solve the problem as to how the stormy areas move about. This gives a remarkable result which provides the first check on our theory. The stormy areas (if small enough) move under precisely the same laws that govern the motions of particles in classical mechanics. *The equations for the motion of a wave-group with given frequency and potential frequency are the same as the classical equations of motion of a particle with the corresponding energy and potential energy.*

It has to be noticed that the velocity of a stormy area or group of waves is not the same as the velocity of an individual wave. This is well known in the study of water-waves as the distinction between group-velocity and wave-velocity. It is the group-velocity that is observed by us as the motion of the material particle.

We should have gained very little if our theory did no more than re-establish the results of classical mechanics on this rather fantastic basis. Its distinctive merits begin to be apparent when we deal with phenomena not covered by classical mechanics. We have considered a stormy area of so small extent that its position is as definite as that of a classical particle, but we may also consider an area of wider extent. No precise delimitation can be drawn between a large area and a small area, so that we shall continue to associate the idea of a particle with it; but whereas a small concentrated storm fixes the position of the particle closely, a more extended storm leaves it very vague. If we try to interpret an extended wave-group in classical language we say that it is a particle which is not at any definite point of space, but is loosely associated with a wide region.

Perhaps you may think that an extended stormy area ought to represent *diffused* matter in contrast to a concentrated particle. That is not Schrödinger's theory. The spreading is not a spreading of density; it is an indeterminacy of position, or a wider distribution of the probability that the particle lies within particular limits of position. Thus if we come across Schrödinger waves uniformly filling a vessel, the interpretation is not that the vessel is filled with matter of uniform density, but that it contains one particle which is equally likely to be anywhere.

The first great success of this theory was in representing the emission of light from a hydrogen atom—a problem far outside the scope of classical theory. The hydrogen atom consists of a proton and electron which must be translated into their counterparts in the sub-aether. We are not interested in what the proton is doing, so we do not trouble about its representation by waves; what we want from it is its field of force, that is to say, the spurious ν which it provides in the equation of wave-propagation for the electron. The waves traveling in accordance with this equation constitute Schrödinger's equivalent for the electron; and any solution of the equation will correspond to some possible state of the hydrogen atom. Now it turns out that (paying attention to the obvious physical limitation that the waves must not anywhere be of infinite amplitude) solutions of this wave-equation only exist for waves with particular frequencies. Thus in a hydrogen atom the sub-aethereal waves are limited to a particular discrete series of freqquencies. Remembering that a frequency in the sub-aether means an energy in gross experience, the atom will accordingly have a discrete series of possible energies. It is found that this series of energies is precisely the same as that assigned by Bohr from his rules of quantisation. It is a considerable advance to have determined these energies by a wave-theory instead of by an inexplicable mathematical rule. Further, when applied to more complex atoms Schrödinger's theory succeeds on those (*Turn to page* 166)

Deadly Gas—*Cont'd*

on the health were found in any of the subjects after the test. On the mental side the psychologists reported that with the tests now in use no distinct effects due to the gas could be found. A slight tendency to poor performance in the prolonged steadiness test was noticed. However, the psychologists concluded that more delicate tests are needed to find any effects on the mind that may result from long exposure to such small amounts of carbon monoxide gas.

Avoiding exposure to carbon monoxide gas is difficult because in the concentrations usually found the gas cannot be detected by its odor. "However, in its occurrence from most sources carbon monoxide is associated with other gases having distinctive odors, and thus warning is given of a dangerous atmosphere," advises a bulletin from the Bureau of Mines. "Removal of the odorous constituents from illuminating gas in scrubbing the gas is often the cause of poisoning to users through absence of warning odor. The odors coming from domestic gas stoves may or may not be a criterion for judging the presence of carbon monoxide. Mice and birds are more quickly affected than men by carbon monoxide and may be used for detecting dangerous atmospheres. Birds are preferable because they show symptoms earlier and are easier to observe."

Although this gas appears as one of our modern killers, it has been a source of danger for ages and was even known as a killer in very ancient times. "The human race has probably been exposed to this gas since men first began using fires in confined or sheltered places," stated a report of the Bureau of Mines. "A number of cases described in the ancient literature indicate that carbon monoxide was a frequent cause of death by accident, suicide and as a means of punishment or torture. Aristotle, who lived from 384 to 322 B. C., stated that 'animals collapse from harmful odors, as man gets a severe headache and often dies through charcoal vapors'. The Romans knew that smoke was poisonous and used the greenest, most smoke-producing wood to put persons to death. The occurrence of carbon monoxide poisoning has increased in frequency through the years until at the present time it is found in the home as well as in many industries."

Common sources of carbon monoxide gas given by the Bureau of Mines to illustrate its universal occurrence are: Mine fires (*Turn to next page*)

New Name for Vitamin

Physiological Chemistry

In the old days when vitamins were strange and little known, scientists called them, for convenience, by the letters of the alphabet. But since the vitamins have been split up into twins and triplets the matter of names has become somewhat involved. Vitamin B, for instance, might mean any of three definite factors, according to what you were talking about. Scientific literature was becoming confused and the public was very much bewildered.

Now an effort is being made to settle the matter, as far as vitamin B is concerned. A committee of the American Society of Biological Chemists considered the matter and after deliberation has recommended three separate names for the three different factors formerly known as vitamin B.

Bios, a term suggested by British workers, is to denote the factor or factors encouraging the rapid growth of yeast cells. The antineuritic factor which is easily changed or destroyed by heat will retain the old family name of B. The more heat-stable, water-soluble, dietary factor which has to do with maintenance and growth, known also as P-P or the pellagra preventive, is to be called G.

The committee also recommended that when more vitamins or other dietary factors are discovered, they should not be given other than descriptive names, such as pellagra-preventive or antirachitic, until their identity is established beyond question.

To avoid future complications, the committee recommended that the American Society of Biological Chemists appoint a committee on vitamin nomenclature, to act in cooperation with the British and other European committees as a clearing house for information on vitamin terminology and with power to name new dietary factors when they are discovered.

Science News-Letter, March 16, 1929

Traffic congestion costs New York more than $1,000,000 a day, it is estimated.

Women of Greenland still wear hoods similar to headdresses of the middle ages.

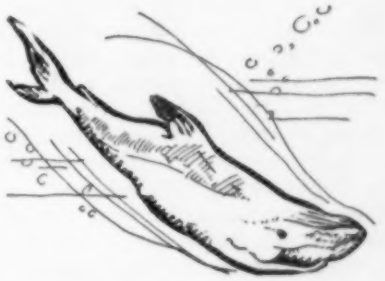
The number of children born in London fell off from 78,825 in 1926 to 73,263 in 1927.

An Arabian legend says that the ostrich traces ancestry back to the camel and the dodo bird.

Nature Ramblings

By Frank Thone

Natural History



Sharks

Timid souls vacationing at southern or southwestern beach resorts will lose a lot of fun unnecessarily if they refuse to go into the water for fear of sharks. Statistically considered, one's chances of being bitten by a shark are considerably less than one's chances of being struck by lightning, and infinitely less than the chances of being struck by a flivver. There are some authentic shark-bite stories on record, but most of the scares are nothing but just what the name implies. Even the six-foot sharks that are frequently seen in the water at bathing beaches are almost without exception harmless scavengers or fish-hunters. The real man-eaters are occasional wanderers from tropical waters, and are two or three times that length.

Sharks are as a whole among the most successful of animal families. They appeared in the world very early, being indeed the oldest of fishes, and the fossil record shows that during all the many thousands of years since their coming they have held their own against all later comers. There are some limestone beds that are as full of the teeth of extinct sharks as a cake is of raisins. For the most part, the teeth, and sometimes the skin scales, are all that is left for the scientists to study; for the skeleton of all sharks is wholly cartilaginous, so that the bones that form the most important parts of most fossil remains, are lacking or at most very imperfectly preserved in the shark records. But some of these old sharks must have been monsters, for four-inch teeth are nothing uncommon in the deposits.

Science News-Letter, March 16, 1929

The carved staff carried by a bishop of the thirteenth century was recently unearthed in Greenland in the ruins of a medieval cathedral.

Wave Mechanics—*Cont'd*

points where the Bohr model breaks down; it always gives the right number of energies or "orbits" to provide one orbit jump for each observed spectral line.

It is, however, an advantage not to pass from wave-frequency to classical energy at this stage, but to follow the course of events in the sub-aether a little farther. It would be difficult to think of the electron as having two energies (i. e. being in two Bohr orbits) simultaneously; but there is nothing to prevent waves of two different frequencies being simultaneously present in the sub-aether. Thus the wave-theory allows us easily to picture a condition which the classical theory could only describe in paradoxical terms. Suppose that two sets of waves are present. If the difference of frequency is not very great the two systems of waves will produce "beats". If two broadcasting stations are transmitting on wave-lengths near together we hear a musical note or shriek resulting from the beats of the two carrier waves; the individual oscillations are too rapid to affect the ear, but they combine to give beats which are slow enough to affect the ear. In the same way the individual wave-systems in the sub-aether are composed of oscillations too rapid to affect our gross senses; but their beats are sometimes slow enough to come within the octave covered by the eye. These beats are the source of the light coming from the hydrogen atom, and mathematical calculation shows that their frequencies are precisely those of the observed light from hydrogen. Heterodyning of the radio carrier waves produces sound; hetrodyning of the sub-aethereal waves produces light. Not only does this theory give the periods of the different lines in the spectra, but it also predicts their intensities—a problem which the older quantum theory had no means of tackling. It should, however, be understood that the beats are not themselves to be identified with light-waves; they are in the sub-aether, whereas light-waves are in the aether. They provide the oscillating source which in some way not yet traced sends out light-waves of its own period.

Science News-Letter, March 16, 1929

There are nine states which have less than half a million people apiece.

The Cuban humming bird, weighing less than a gram, holds the record for the world's smallest bird.

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Deadly Gas—*Cont'd*

and explosions, the gaseous products of combustion of powder and dynamite and other explosives, blast-furnace stack gas, coke-oven gas, coal gas, producer gas, gas ranges and room heaters burning natural and manufactured gas, automobile exhaust gas, smoke from burning buildings, and railroad locomotive stack gas.

Automobile exhaust gas can be dangerous outside of garages, although it is always lack of oxygen that is the real cause of death, so that small closed spaces are danger spots in which to run motors. However, two truck drivers recently met death from exposure to carbon monoxide poisoning out on the road. They had stopped their truck but left the engine running, presumably to warm the driver's cab, which they had closed tight. They were found unconscious. The fact that the police did not at once recognize them as victims of carbon monoxide poisoning signed their death warrants. For they were locked up in jail where the scanty supply of oxygen in the air finished the job begun by the deadly gas from their truck's exhaust. Restorative measures taken some time later failed to revive them.

Allowing motors to idle while in traffic is one way to increase the amount of carbon monoxide in the air. This is particularly true because while waiting for the traffic control to change drivers often use the accelerator several times to keep their engines from stalling. This practice yields relatively high amounts of carbon monoxide and smoke, the Bureau of Mines found.

To avoid death from this poison gas, a plentiful supply of oxygen or of fresh air must be maintained at all times. In addition, correct adjustment of automobile carbureters, and careful attention to tubes and connections on domestic stoves, etc., should be made.

Fresh air, or oxygen from an oxygen tank, and absolute rest are the essentials of treatment for carbon monoxide poisoning. Both these measures should be prolonged for several hours, because it takes a long time to drive all the carbon monoxide out of the blood.

Science News-Letter, March 16, 1929

There is no plant life in the sea below the point where sunlight can penetrate.

The longest jumping that a flea can do is about 13 inches horizontally and about six inches vertically.

FIRST GLANCES AT NEW BOOKS

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—Report of the Ninety-sixth Meeting, Glasgow, 1928—*British Association. London* (25s.). Each year the meeting of the British Association for the Advancement of Science affords a review and summary of not only British science but research and discovery in many other parts of the world. This report is unusually fat and meaty.

General Science
Science News-Letter, March 16, 1929

STANDARDS YEARBOOK, 1929—The National Bureau of Standards—*U. S. Government Printing Office* ($1). The wheels of industry and commerce run smoothly because of effective and widespread standardization sponsored by association and governmental activities. For the third year the National Bureau of Standards has issued a handbook to standardization accomplishments.

General Science
Science News-Letter, March 16, 1929

POPULAR SCIENCE TALKS—*Phila. College of Pharmacy & Science* ($1). The sixth volume in a series of books in which are printed the interesting lectures on popular science that the college presents each year. This one covers a diversity of topics, such as "What and Where Are the Stars", by Dr. George Rosengarten; "The Romance of Cookery", by Dean Charles H. LaWall; "The Realm of the X-Ray", by Dr. Ivor Griffith; "Animals That Live in Man", by Dr. Marin S. Dunn, and eight others.

General Science
Science News-Letter, March 16, 1929

RADIOMOVIES, RADIOVISION. TELEVISION—C. Francis Jenkins—*Jenkins Laboratories (1519 Conn. Ave., N. W., Washington)* ($2.50). Here, gathered into a handy volume, are the articles on constructing a radiovisor which Mr. Jenkins prepared for Science Service, and which were published in the SCIENCE NEWS-LETTER last autumn. This is supplemented by accounts of some of his other inventions, such as the radio weather map transmitter, the drum scanner for radiovision, in which a small drum replaces a large disc and a new airplane altimeter. With the author's earlier "Vision by Radio" (1925), it forms a concise summary of the achievements of one of America's most clever inventors.

Invention
Science News-Letter, March 16, 1929

MAN ALIVE—Avrhum Gedalue—*Acme*. The book has the appearance of being another popular explanation of the structure and functions of the human body. Actually the author has perverted and misinterpreted the facts to fit his own peculiar and unsound theories of the cause of disease. The book contains just enough truth to deceive the ignorant and unwary. It is a glowing example of one fault of modern education, the production of would-be philosophizers and theorizers who have a ready vocabulary but no sound knowledge or logic to back it up.

Medicine
Science News-Letter, March 16, 1929

MODERN PREVENTIVE MEDICINE—Sir Arthur Newsholme—*Williams & Wilkins* ($4). This book tells the story of preventive medicine since the days of Pasteur. Progress in the knowledge of cause, cure and prevention of communicable diseases and also of glandular and dietary or deficiency diseases is given briefly. The book is intended as a continuation of the author's earlier volume, the "Evolution of Preventive Medicine." The discussion of each topic is necessarily brief, although clarity is not sacrificed. The book is meant to be elementary and to furnish the stimulus for further study of the subject on the part of students and social and medical workers.

Medicine
Science News-Letter, March 16, 1929

RENE THEOPHILE HYACINTHE LAENNEC—Gerald B. Webb—*Hoeber* ($2). The book was inspired by the Laennec centenary in December, 1926, and is expanded from an address on Laennec given before the Denver Clinical and Pathological Society. It is the only full-length account in English of the life and work of this great physician whose treatise on auscultation is one of the classics of medicine.

Medicine
Science News-Letter, March 16, 1929

WILLIAM HARVEY—Archibald Malloch—*Hoeber* ($1.50). The tercentenary of William Harvey's birth was the occasion for the writing of this small volume which gives a brief but interesting account of the life and important work of one of the world's greatest physicians. It was Harvey who first discovered how the blood circulates.

Medicine
Science News-Letter, March 16, 1929

THE BISHOP MURDER CASE—S. S. Van Dine—*Scribners* ($2). Never before has the SCIENCE NEWS-LETTER reviewed a detective story. Even though this is the latest and best of a quartette of books by an author (Willard Huntington Wright) who, with Philo Vance, now fills the place left vacant by Conan Doyle when he retired Sherlock Holmes for the last time, that alone would not qualify it for mention in these pages. But when the murderer is a mathematical physicist and mathematical physics plays an important part in the book, then the book rises into a class of its own. What makes the book still more unique is that Mr. Wright handles Riemannian geometry, tensors, Einsteinian curved space and such things with such facility that critical mathematicians have been unable to find any technical errors. However, the occasional use of language by the characters which, while perfectly correct, is not quite what a mathematical physicist would be likely to use under such circumstances, and the misspelling of such a well-known name as Shapely (rendered Shapliegh) show that the author has "read up" on modern physics for the occasion. But there are few authors with the necessary background to absorb such "reading-up", and so this book is to be recommended to all who like to read a good mystery story without having their intelligence insulted by a too-obvious solution.

Mathematical Physics
Science News-Letter, March 16, 1929

COMMONWEALTH FUND ANNUAL REPORT—The report covers the activities sponsored by the Commonwealth Fund during 1928 in the fields of education, public health, mental hygiene, child guidance, legal research, publications, etc. Particularly interesting are the reports of the Commonwealth Fund Fellowships and of the work of the Austrian division, work which will be discontinued on July 1 next, after five years of successful public health activities.

Education—Public Health
Science News-Letter, March 16, 1929

FLOODS IN THE VALLEY OF THE MISSISSIPPI—J. P. Kemper, C. E.—*National Flood Commission, New Orleans, La.* A plea for the plan of Mississippi flood relief advocated by one group interested in the flood problem.

Engineering
Science News-Letter, March 16, 1929

Book Reviews—*Continued*

REFERENCE BOOK OF INORGANIC CHEMISTRY—Wendell M. Latimer and Joel H. Hildebrand—*Macmillan* ($3.75). Here is an excellent, complete, yet concise summary of inorganic chemistry. As the name implies, it is not a text-book. "The authors," they say, "have sought to present essential chemical facts briefly, clearly and in due relation to other facts and principles. The instructor using it will have to map out his own course, following whatever order of arrangement appeals to him. "Obviously, the success of such a work depends largely upon the instructor. If he is a good one, he could teach his students far more with its aid than by following any stereotyped plan, but in the hands of a poor instructor, it would probably not be so satisfactory. Besides the student, however, teachers themselves and industrial chemists will undoubtedly find it to be a valuable volume for their reference shelf.

Chemistry

Science News-Letter, March 16, 1929

ANALYTIC MECHANICS—Joseph B. Reynolds—*Prentice-Hall* ($4). This text in analytic mechanics is intended primarily for students in technical schools and colleges. Many practical applications are given and explained, while others are suggested or involved in the problems set for the student to solve. The development is such that, with some omissions, the text can be used equally well where a course in pure or theoretical mechanics is desired. In kinematics the foundation required is a working knowledge of analytic geometry and the calculus. In kinetics, a working knowledge of elementary mechanics and kinematics is required.

Mechanics

Science News-Letter, March 16, 1929

GENERAL SCIENCE—Anna B. Regenstein and William Ray Teeters—*Rand, McNally* ($1.60). A new addition to the already rather crowded field of general science textbooks, but one which adequately covers the subject. Any teacher using it, however, would do well to tear out the color plate containing Fig. 222, showing a solar eclipse with a brilliant red corona, an inaccuracy of coloring that is inexcusable.

General Science

Science News-Letter, March 16, 1929

AVIATION LAW—Henry G. Hotchkiss—*Baker, Voorhis & Co.* ($7.50). Every new application of science creates its special laws. Adolescent aviation's regulations—international, federal and state—are given in this volume.

Aeronautics

Science News-Letter, March 16, 1929

THE TRAGEDY OF THE ITALIA—Davide Giudici—*Appleton* ($3). The Italian correspondent upon the Soviet rescue ship, the Krassin, tells his story of the ill-fated Nobile Arctic flight.

Aeronautics

Science News-Letter, March 16, 1929

AIR NAVIGATION AND METEOROLOGY — Richard Duncan — *Goodheart-Willcox* ($3). Since the enthusiastic yachting amateur of previous decades now has his counterpart in the air, this book on navigation and weather in the ocean of the atmosphere will appeal to non-professionals as well as those who make aviation their profession.

Mathematical Physics

Science News-Letter, March 16, 1929

RACING THE MOON (AND WINNING)—John Henry Mears—*Henkle* ($2). If Jules Verne could only have lived until today! This is the story of the swiftest journey ever made around the world.

Aeronautics

Science News-Letter, March 16, 1929

NOTRE TOUR DE LA TERRE—D. Costes et J. M. LeBrix—*Librairie Hachette* (75c). The story, in French, of a noteworthy aeronautical achievement.

Aviation

Science News-Letter, March 16, 1929

SOUTH AMERICA—Harry A. Franck—*F. A. Owen* (96c.). A travel reader without a dull page. The author chooses the method of telling about his own journeys, and he is a traveler who is not afraid to swim rivers, hike hundreds of miles, wade through swamps, and live among native tribes. With all the picturesque adventures and colorful detail, he never fails to present the facts that a travel reader of this sort is expected to give to boys and girls of intermediate grades.

Geography

Science News-Letter, March 16, 1929

Third Hand Needed for Perfect Photos

Astronomy

Any details of heavenly objects that can be seen with modern astronomical telescopes can also be photographed, but the astronomer really should have three hands to do it with. However, since no race of three-handed astronomers has yet been evolved, he can use his lips in place of the extra appendage, suggests Prof. G. W. Ritchey, American astronomer, who has been working at the Paris Observatory for several years.

In a recent report to the Royal Astronomical Society of Canada, Prof. Ritchey described his recent work, which points the way to astronomical photographs magnified thousands of diameters. He began his work at the University of Chicago's Yerkes Observatory in Wisconsin, and was later connected with the Mt. Wilson Obervatory in California, where he made the great 100-inch mirror of the world's largest telescope.

The difficulty in securing satisfactory photographs of fine details on heavenly bodies, like the moon, arises from the fact that we live at the bottom of an ocean of air. Even on top of the highest mountain, there is a large mass of atmosphere, in continual turbulence, between the telescope and the sky. Even when relatively still, thre are changing currents which bend a ray of light from the heavens first one way and then the other.

In the telescope, the motions are greatly magnified. Prof. Ritchel told of his observatinos of the moon with the 40-inch telescope at the Yerkes Observatory. On nights that were unusually favorable, he observed tiny lunar craters with very high powers. They were very sharply defined and appeared quite still, but when he put in a ring containing cross-hairs, so that a network of fine reference lines appeared in the eyepiece also, he saw that the craters were continually moving in every direction. Without the cross-hairs, the eye unconsciously followed the motions and they appeared still.

Besides the motion, however, the fineness of the detail constantly changed.

"At the best instants," said Prof. Ritchey, "the exquisitely small details come out sharp (*Turn to next page*)

Treasures Among Rubbish

Archæology

Clay tablets bearing writing more than 5400 years old, suggesting the probability of still older tablets yet to be found beneath them, were among the fruits of exploration of a "poor" tomb at Ur, in ancient Mesopotamia. The results have been announced by the University of Pennsylvania, which is conducting its expedition jointly with Oxford University.

The clay tablets, and a quantity of seal-impressed clay jar stoppers which were found with them, are very much older than the tomb at whose bottom they were found. The excavation had led through a "death pit" of the type customarily encountered in connection with a royal or aristocratic burial of the third millenium B. C., where row on row of courtiers and servants were laid out to wait upon their lord in the after-world. But in this particular "death pit" the skeletons were much more poorly clad than is usually the case in such burials, having only a few silver ornaments in place of the gold most frequently found.

Yet this relatively poor burial chamber proved to be one of the richest finds in Ur, from an archaeologist's point of view. For all the graves had been dug into a vast rubbish pit which (*Turn to next page*)

Europe to Save Beaver

Zoology

Beaver, once almost wiped out in the United States, but now becoming re-established through wise protective measures, are now the objects of similar care in certain of the countries of Northern Europe, according to Dr. Theodor G. Ahrens, a well-known naturalist residing in Berlin.

There is a "beaver oasis" between Torgau and Magdeburg on the Elbe. Before the war there were 188 animals in it, but during hostilities it suffered from the inroads of poachers. Now, however, it is returning to normalcy, and it is estimated that there are 150 animals in the colony. In Prussia and Anhalt there is a permanent closed season on beaver. The willows around their streams are not cut, and new ones are planted for their benefit. Human beings are kept out of their preserves as far as possible.

The beaver are receiving protection in Russia also, though during the war and the early days of the revolution the animals here were badly persecuted and the morale of the survivors shaken, making them very restless and prone to migrate. It is hoped that through strict protective measures and the creation of reserves the beaver may in- (*Turn to next page*)

World's Greatest Toothache

Paleontology

Texas has long been famous for the longest horned cattle, for the greatest oil wells, for its wealth of ancient animal life preserved in its extensive Red Beds and now it comes to the front as having produced an example of the greatest toothache known to man or animal.

A. H. Dosser found near Corsicana several molars of the large imperial elephant. This extinct beast stood nearly fourteen feet high at the shoulders. Among the bones was a much twisted, deformed tooth weighing about twenty pounds, which has been interpreted as an impacted lower molar, recalling in all essentials a badly impacted lower human molar.

This mammoth tooth had a hard time trying to come through, and had itself badly twisted as the thirteen thick dental plates which form the tooth had continued to grow, trying to erupt. A few of the enamel plates had succeeded in forming a circular crown, but the eight enamel plates are placed at right angles to the remaining unerupted plates.

Pain would be due to the pressure exerted by the growing tooth trying to come through the bone and gums. If the size of the pain is comparable to the size of the tooth, then great indeed most have been the pain.

This particular elephant was the largest of any of the different kinds of elephants which lived in North America during and for some time after the great Ice Age. The imperial elephant roamed all over the wide stretch of Southern United States, from Florida to Southern California.

Science News-Letter, March 16, 1929

Record for Bird Flight

Ornithology

The longest flight record ever reported to the Biological Survey for a banded bird was that of a fledgling Arctic tern, banded at Turnevick Bay, Labrador, on July 23 of last year by Oliver L. Austin, Jr. This bird was found dead on the beach at Margate, fifteen miles southwest of Port Shepstone, Natal, South Africa, on November 14. This is a remarkable record, not only for the distance covered, but for the time element, as the bird could have been only about three months old. It suggests the possibility that the birds, which are rarely or never seen on the South Atlantic Coast of the United States, may cross the ocean to Europe, and then proceed south.

The Arctic tern is well named, for it nests as far (*Turn to next page*)

Pretty Soft

Natural History

By JAMES J. MONTAGUE, in the *New York Herald-Tribune.*

I know the bluejay's wicked ways:
  Throughout the summer time
The wretch devotes long, idle days
  To piracy and crime.
If but they hear his raucous cry
  The robins take alarm
And swiftly to their nests they fly
  To save their babes from harm.

I know the squirrel far too well—
  Egg robber that he is,
The jay himself can scarce excel
  That evil stealth of his:
And when a sparrow pipes her woes
  Or catbird her despair
Above an empty nest, I know
  What rascal has been there.

But when the gentler birds have gone
  And frozen is the ground
And yonder, out across the lawn,
  I hear a pleading sound,
I know the bluejay has come back,
  His beady eyes a-shine;
He knows I will not let him lack
  The wherewithal to dine.

And when the squirrel cannot find
  Among the frozen weeds
The store of nuts that he designed
  To serve his winter needs,
He comes and chatters at the stoop
  As beggars often do,
And I become his easy dupe;
  He gets his dinner, too.

Science News-Letter, March 16, 1929

New Bird Record—*Cont'd*

north as land has been discovered. It arrives in the Arctic region about June 15 of each year, and leaves about August 15 for its winter home, after its young are full grown. Several months after leaving its summer home this bird is found near the Antarctic continent, which is 11,000 miles from its starting point. It is estimated that at least 150 miles a day are covered on its migration flights, although ornithologists do not yet know its exact routes. Spending its life at opposite ends of the globe, the Arctic tern has more hours of daylight and sunlight than any other animal in the world. In the north the sun never sets during its entire stay, and in the Antarctic regions broad daylight continues throughout its sojourn there.

Science News-Letter, March 16, 1929

A study of the quality of fleece shows that the finest wool on a sheep grows on the cheek or back of the ear.

Perfect Astronomical Photos—*Continued*

and distinct, often for a duration of two or three tenths of a second, sometimes for six or seven tenths of a second, seldom for a full second. The time between these best instants varies, in general, from one to four seconds. Perhaps the most remarkable effect was that the mind of the observer, keenly intent on noting the exquisitely small details visible at most favorable instants, disregards or even forgets the less favorable moments between. It was only by forcing the attention to observe all of these phenomena that it was realized that the instants of finest definition occupied only one-fourth of the total elapsed time."

It is to take care of this effect that the third hand is needed. By using a very light plateholder that can be moved up or down and right or left very rapidly, the motions of the image can be followed. One hand is required for each direction. In addition a shutter is needed that can stop the exposure during all but the most favorable moments, and Prof. Ritchey suggests that this can most conveniently be operated with the lips.

As adjustments should be made many times a second, Prof. Ritchey constructed a practice machine, giving the effects artificially. With this he was able to make as many as sixteen adjustments a second. At least an hour a day should be devoted to practice with such a machine by the astronomer, he said.

Using such refinements on a telescope of 1 feet aperture, about the size of the new one recently announced from the California Institute of Technology, it would be possible, he said, to photograph the general form of details on the moon as small as 100 feet in diameter, or on Mars as small as 2.8 miles in diameter. Such a telescope would be able to magnify the stars 24,000 diameters, while 14,500 diameters could be applied to extended objects, like nebulae, the moon and planets.

Science News-Letter, March 16, 1929

Only seven states had more people on farms in 1925 than in 1920.

Scientists are attempting to achieve a weedless farm at the University of California, as an example to farmers of the state.

Save Beaver—*Cont'd*

crease and again become game animals.

However, by far the greater number of European beaver live in Norway; their total has been estimated variously as 10,000 to 14,000. Since 1926 they have enjoyed a permanent closed season, except that at the discretion of the Minister of Agriculture a few may be captured from time to time in certain designated districts. The present flourishing state of the beaver in Norway has been build up since 1899, when only a few of the animals were left alive. Norway even has beaver to spare for her neighbors, and Sweden expects to colonize her national parks from Norwegian stock.

Science News-Letter, March 16, 1929

In the Chesapeake Bay region there are more than 200,000 acres of shellfish beds.

Llamas differ from camels in being smaller, having no hump, and having large ears.

A writer on aeronautics in 1786 advised balloon ascents for convalescents, because of the purity of the air and the restfulness of the voyage.

Treasure Rubbish—*Cont'd*

sloped down from the walls of the earliest Sumerian settlement to the marsh or river out of which it rose, and the bottom of this particular "death pit" just touched a stratum of rubbish, necessarily much older than itself. In this rubbish were found the inscribed tablets and jar stoppers.

These prove to be among the oldest of written documents, certainly the oldest thus far found at Ur. They date to the same time as certain clay figurines found last year, whose cultural level could not then be determined. They are not so old as the tablets found a short time ago near Kish, bearing an exceedingly archaic form of picture writing, but the fact that they lie at the top of a heap of debris as yet wholly unexplored promises that when the spades go down through it they will probably turn out specimens of writing as old as those of Ur's rival city.

Science News-Letter, March 16, 1929

There were more than 20,000 students in the medical colleges of the United States last year.

Of the old Roman town of London, there remain only 13 fragments of wall and brick work now visible.

CLASSICS OF SCIENCE: Linnæus' Classification

Botany

The first part of Linnæus' scheme of plants, including his delightful account of the Princes, Nobles, New-Colonists, Slaves, Vagabonds and many other castes of the vegetable world, appeared in the SCIENCE NEWS-LETTER last week. In this concluding part, the functions of the different parts of the plant are explained, and True Botanists are distinguished from False Botanists.

PART TWO

A SYSTEM OF VEGETABLES. according to their Classes, Orders Genera, Species, with their Characters and Differences. In two volumes. Translated from the Thirteenth Edition (as published by Dr. Murray) of the SYSTEMA VEGETABILIUM of the late Professor Linneus; and from the SUPPLEMENTUM PLANTARUM of the present Professor Linneus. By a Botanical Society at Lichfield, London, MDCCLXXXIII (1783).

Vegetable Kinglom Continued

23. VEGETATION is produced by the *Rootlets* sucking up the aqueous tincture of the Soil; which, by daily addition of heat, is gently driven through the vessels of the external corporeal part; whence the nutrition of the exterior and interior plant, the superfluous moisture exhaling, the *Bark* depositing the *Rind* on its interior surface, which annually changes itself into a *Woody* substance, (in Annual ringlets interspersed with the Alburnum, which at length almost ossifies as the lower branches decay) this woody substance afterwards sustains the ascending Stock, in the summits of which the living *Pith* advances.

I conceive the MEDULLA, or PITH, to consist of a bundle of equally diverging Nervous fibres; in which medulla the protrusive vital power breaks the ultimate nerves; which there diverging, penetrate the bark, as yet gelatinous; where these medullary nerves at the summit are in like manner multiplied in the Bud. From the vessel ascending through this nerve being divided, and the ascent of the propelled fluid being impeded beneath, the bark is extended into a *Leaf*.

This LEAF, which is agitated by the passing winds, attracts and prepares the fluids (except those of the Parasite-Plants, which are previously prepared), inhales electric matter from the light with its upper surface, perspires a dew from its under surface, and perishes never to be renewed.

PARTS OF THE FLOWER

133—Spathe, Spadix; 134—*a* Glume *calyx*, Fig. 132—Spathe, the Calyx *of Narcissus; b* Awn; 135—*a* Universal umbel, *b* Partial one, *c* Universal Involucre, *d* Partial one; 136—*c* Calyptre, *b* Lid, *a* Head; 137—Ament; 138—Strobile; 139—*a* Hat, *b* Volve; *c* Stipe of a Fungus; 140—*a* Common naked Receptacle; 141—Common Receptacle *imbricated* with chaffi; 142—*a* Tube, *b* Border *of a one-petal'd Corol;* 143—Flower *a* Germ, *b* Style, *c* Stigma, *d* Filaments, *e* Anthers, *f* Petals; 144—*a* Claws, *b* Folds *of a many petal'd corol;* 145—Bell'd Nectary in Narcissus; 146—Horn'd Nectaries in Aconitum; 147—Horn'd Nectary in the Calyx of Tropaeolum; 148—Nectaries in Parnassia

But the Larva of the herb is DISPLAYED, when the protrusion of the Medulla is greater than the retention of the including Body; when the substance of the *Bark* is expanded in the Calyx, that of the *Rind* in the Corol, that of the *Wood* in the Stamens, that of the *Medulla* in the Pistil; the vegetation thus terminates in new life, the threads of life being collected into the ultimate Seeds of the Medulla.

24. The PROLEPSIS exhibits the mystery of the Metamorphosis of Plants, in which the *Larva* of the Herb is changed into a *Displayed* Fructification; for it is the office of a Plant to produce either a leafy *Herb* or a *Fructification.*

A genuine BUD is the compendium in its bosom the principle of a multiplying Branch, either such actually or potentially; and since the Leaf is produced for this cause, and no other, a Leaf cannot exist, unless this principle has previously perforated the bark, from which it arose, although the effect appears before the cause.

A genuine BUD is the compendium of a future *Branch,* into which it is at length unfolded. A Bud always consists of *Scales,* which are so many rudiments of Leaves, and are pressed together till the future branchlet becomes elongated. *And since* the Leaf cannot exist without the Bud, it follows that buds lie concealed in the bosom of every bud-scale, and this is evident to the eye, whence every bud can be nothing more than a body composed of leaves and Budlets. It follows therefore that every Bud consists of Leaves with their Budlets, and these *Budlets* in the like manner of less scales or budlets, and so forward even to the fifth generation (as in the Volvox), nor further, as appears in the metamorphosis. Therefore a leafy Branch of the present year is pregnant with all the branchlets to be produced through *five years,* new ones always succeeding at the extreme summits, in the place, at the base, of those fallen off, that the five series may be perpetual. This happens in *Trees,* where the medulla is delayed by the harder woody substance; but in annual *Plants,* where the resistance of the less compact body against the medulla is less, it can sooner pass into Flower without the delay in the bud; for whatever increases the protrusion of the Medulla, and weakens the power of the including Body, promotes the florescence.

When a Tree produces a FLOWER, Nature anticipates the progenies of five years, then all coming forth together; in forming from the bud-leaves the *Bractes* of the next year, the *Calyx* of the following one, the *Corol* of that succeeding it, the *Stamens* of the fourth, (*Turn to next page*)

Linnæus' Classification—*Continued*

and *Pistil* of the fifth; which is filled with the granulated Medulla of *the Seed*, the termination of vegetable life.

25. FLORESCENCE exhibits the *Espousals* of Plants in the Flower, and the *Nuptials* in the Anthesis.

The FLOWER, the unclad Larva of the Herb, comes forth from the displayed, internal plant, naked and perfect, like the above mentioned flying *Insect; Wing-sheathed* in respect to the Calyx, *Winged* in respect to the Corol, consisting alone of the *Organs* of Reproduction: In the *Males* the stamens have their Anthers replete with the Prolific *Powder* containing the vivifying *Fovilla:* In the *Females* the Pistils have their *Ovarium* terminated with a tubular and *moist Stigma*.

The ANTHESIS takes place, when the burst Anthers scatter their bags of *Dust* upon the *Stigma*, when this dust gives out the included male *Fovilla*, to be absorbed by the prolific *Lymph* of the *Stigma;* so that the male corporeal part and the Female medullary one, produces the seed, or *Egg*, which is nourished in the Ovary to its due maturity.

26. The PRINCIPLE of Fructification, the Foundation of Botany, should be traced higher.

Problem: We may suppose GOD at the beginning to have proceeded from simple to compound, from few to many! and therefore at the beginning of Vegetation to have created just so many different plants, as there are *Natural Orders*. That HE then so intermixed the plants of these orders by their marriages with each other; that as many plants were produced as there are now distinct *Genera*. That Nature then intermixed these Generic plants, by reciprocal marriages (which did not change the structure of the flower), and multiplied them into all possible existing *Species;* excluding, however, from the number of Species, the *Mule-plants* produced from these marriages, as being barren.

Each GENUS therefore is natural, Nature assenting to it, if not making it.

The CHARACTER therefore never constitutes the genus, but is itself diligently to be constructed according to the Genus of Natu[illegible]

Kindred PLANTS of the same mother are to be known in respect to the Genus by the flower, or displayed plant, when the reciprocal unadulterated marriage leaves the Fructification intire; but in the species are to be distinguished from their sister-companions, produced by a different father, according to the Herb.

Thus the DIAGNOSIS of a plant consists in the affinity of the *Genus*, and in the difference of the *Species*.

The NAME of a plant therefore, that it may refer to each diagnosis, is double: the *Generic* Family Name,

And the *Specific* trivial Name, under which latter are the vague *Synonymies* of authors.

The BOTANIST, in following the *Classifications*, is led to the named *Genus* by the *Characters* of the displayed plant or flower; to the appellation of the *Species* by the *Differences* of the Larva or herb; and thence to its *Synonymies;* from these to *Authors*, and thence to *every thing*, which has come to us from our ancestors on the subject. Thus the plant itself tells its Name, and its History amid such a multitude of species, and of individuals; this is the great purpose of Botany, the invention of the present age, to the completion of which all true Botanists will contribute their labor.

27. True BOTANISTS will labour to increase this lovely Science: will construct Fundamental DESCRIPTIONS in characteristic words, particularly of obscure, rare and new Plants, according to the rule of Delineation of a plant; as is done by my *Son*, and *Schreberus in Decuriis*.

Will add FIGURES, if they are able, which represent the perfect Plant, such as are given by *Vaillant, Dillenius, Ehret, Jacquin, Trew, Schmiedel*, etc.

Will discover the most compendious and most proper specific DIFFERENCES.

Will enquire the SYNONYMIES of authors, particularly the best, *as Haller*.

Will always prefix the natural GENUS to the Species; and when new, will define it by its natural *character* from the situation, figure, number, proportion, of all the parts of fructification.

Will refer the vague and new SPECIES to certain genera; as *Tournefort, Plumier, Brown, Jacquin*.

Will point out the natural *Order*, where it appears.

Will mark the native STATIONS of each plant, and will therefore produce more *Floras*, where there is opportunity, particularly *Southern or Exotic ones*.

Will observe their PROPERTIES, as their *Duration, Semination, Gemmation, Vernation, Aestivation, Nuptials, Frondescence, Calendar, Horologue, Sleep, Qualities*.

Will add their USES; whatever uses of *Nature* (of the Pan and of the Pandora) the *Physician* the *Oeconomist*, etc., have discovered, and of these whatever contributes most to the glory of the Author of all, and to the advantage of Human Life; that at length our posterity may enjoy the meridian light of the science.

False BOTANISTS proclaim the Laws of the Art before they have learned them:

Extol absurd Authors, and are jealous of the excellent ones:

Steal from others, producing nothing of their own:

Boast much of a little knowledge:

Pretend they have discovered a natural Method:

Assert the Genera to be arbitrary.

Carl Linné was born in Roshult, Sweden, May 13 (O. S.) 1707, and died January 10, 1778 at Upsala. At the age of 20, destined by his family for holy orders, his teachers advised his father to apprentice him to a shoemaker, as he had no aptitude for his studies. His friend, Dr. Rothman, recognized his scientific ability, and turned him to the study of medicine. At the age of 25 he went on a scientific exploration of Lapland. At 28, in Holland to get his M.D., he showed the MS of the "Systema Naturae" to Gronovius, who enthusiastically published it at his own expense. In the next 30 years Linnæus wrote nearly 200 works on Botany. He became Professor of Botany at Upsala at 34, where he continued to teach for the rest of his active life.

Science News-Letter, March 16, 1929

In 1778, there were about 500 cattle in California; by the end of that century there were 74,000.

A method of measuring and recording the exact shade of a color, based on the principle of spectrum analysis, makes it possible to match colors by cable.